Translation

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference	FOR FURTHER ACTION	See Form PCT/IPEA/416
K-484		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/JP2004/001230	05.02.2004	06.02.2003
International Patent Classification (IPC) or national classification and IPC		
G02B 5/18, B23K 26/06, G02B 27/46		
Applicant		
SUMITOMO ELECTRIC INDUSTRIES, LTD.		

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 7 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
   a. ☒ *(sent to the applicant and to the International Bureau)* a total of 5 sheets, as follows:
      ☒ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
      ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
   b. ☐ *(sent to the International Bureau only)* a total of (indicate type and number of electronic carrier(s))

      _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:

☒	Box No. I	Basis of the report
☐	Box No. II	Priority
☐	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
☐	Box No. IV	Lack of unity of invention
☒	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
☐	Box No. VI	Certain documents cited
☐	Box No. VII	Certain defects in the international application
☐	Box No. VIII	Certain observations on the international application

Date of submission of the demand	Date of completion of this report
Name and mailing address of the IPEA/	Authorized officer
Facsimile No.	Telephone No.

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/JP2004/001230

Box No. I Basis of the report

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ This report is based on translations from the original language into the following language _____, which is the language of a translation furnished for the purposes of:

☐ international search (Rule 12.3 and 23.1(b))

☐ publication of the international application (Rule 12.4)

☐ international preliminary examination (Rule 55.2 and/or 55.3)

2. With regard to the **elements** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

☐ the international application as originally filed/furnished

☒ the description:

pages 1-32 as originally filed/furnished

pages* _____ received by this Authority on _____

pages* _____ received by this Authority on _____

☒ the claims:

nos. 1-8 as originally filed/furnished

nos.* _____ as amended (together with any statement) under Article 19

nos.* _____ received by this Authority on _____

nos.* _____ received by this Authority on _____

☒ the drawings:

sheets _____ as originally filed/furnished

sheets* 1/5-5/5 received by this Authority on 29-11-2004

sheets* _____ received by this Authority on _____

☐ a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages _____

☐ the claims, nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to sequence listing *(specify)*: _____

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

☐ the description, pages _____

☐ the claims, nos. _____

☐ the drawings, sheets/figs _____

☐ the sequence listing *(specify)*: _____

☐ any table(s) related to sequence listing *(specify)*: _____

* *If item 4 applies, some or all of those sheets may be marked "superseded."*

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

International application No.
PCT/JP2004/001230

Box No. V **Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

1. Statement

Novelty (N)	Claims	8	YES
	Claims	1-7	NO
Inventive step (IS)	Claims		YES
	Claims	1-8	NO
Industrial applicability (IA)	Claims	1-8	YES
	Claims		NO

2. Citations and explanations (Rule 70.7)

Document 1: JP 2000-231012 A (Sumitomo Electric Industries, Ltd.), 22 August 2000, entire text, all drawings

Document 2: JP 2001-62578 A (Sumitomo Electric Industries, Ltd.), 13 March 2001, entire text, all drawings

Document 3: JP 2002-228818 A (Taiyo Yuden Co., Ltd.), 14 August 2002, entire text, all drawings

Document 4: JP 11-183716 A (Dainippon Printing Co., Ltd.), 09 July 1999, entire text, all drawings

Claim 1

Documents 1 to 3 disclose diffractive optical elements with a diffractive surface which comprises a plurality of cells that are arranged in the columns and rows.

In addition, the documents in question indicate that it is possible for the aforementioned cells to have a plurality of thicknesses, levels and heights; therefore, these documents substantially indicate that it is possible for the cells to have phases that correspond to the aforementioned thicknesses, levels and heights.

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

With regards to the transparent rectangular cells that are provided to the diffractive optical part, claim 1 specifies that the diffractive optical part does not have a configuration comprising repeating unit patterns that have identical cell arrangements, and indicates that it is possible to configure so that each of the RS number of cells have a complex amplitude transmittance (t_{mn}) value that is not restricted by the complex amplitude transmittance values of the other cells.

On the other hand, document 1 discloses a preferred embodiment with a configuration comprising repeating unit patterns that have identical cell arrangements, whereby it is made possible to carry out calculations by means of fast Fourier transformation (FFT) in order to simplify the calculations, the computational complexity thereof and the like. However, the technical concept that is presented in document 1 is not limited to application only in combination with structures comprising repeating unit patterns that have identical cell arrangements; therefore, the technical concept in question can also be applied in combination with configurations without repeating unit patterns that have identical cell arrangements. For example, the complex amplitude (W) values that are included within formula (12) could be obtained by exactingly calculating the diffraction integral without emphasizing the reduction in the computational complexity of the calculations.

Consequently, the invention that is set forth in claim 1 lacks novelty and does not involve an inventive step in the light of document 1.

In addition, document 3 discloses a feature wherein each cell has an independent phase. Therefore, the

invention that is set forth in claim 1 lacks novelty and does not involve an inventive step in the light of document 3.

Furthermore, diffractive optical elements and holographic optical elements which comprise a plurality of arrayed cells, wherein each cell has an independent phase, are well known and commonly used, as disclosed in document 4. Therefore, it would be easy for a person skilled in the art to configure so that in diffractive optical elements for splitting one beam of light into a plurality of beams of light, such as those which are disclosed in documents 1 to 3, the plurality of cells that have been provided to the aforementioned diffractive optical element have independent phases.

Consequently, the invention that is set forth in claim 1 does not involve an inventive step in the light of documents 1 to 4.

Claim 2

Claim 2 sets forth the invention of a product; i.e. a diffractive optical part. However, the technical feature of calculating and assigning the complex amplitude of the diffracted light by means of "formula 1" without using fast Fourier transformation does not characterize the final form or structure of the invention in question. As a result, the invention that is set forth in claim 1 and the invention that is set forth in claim 2 are substantially the same as physical embodiments; therefore, the invention that is set forth in claim 2 lacks novelty and does not involve an inventive step for the same reasons as are indicated in relation to claim 1, above.

In addition, a person skilled in the art could determine what method of calculation to use in invented processes which include the item that is set forth in claim 2, as appropriate; therefore, even if claim 2 were to be amended so as to set forth the invention of a process, said claim would not involve an inventive step.

Claims 3 and 4

Fraunhofer-type diffractive optical elements and Frenel-type diffractive optical elements are well known, and a person skilled in the art could select which type of element to employ, as appropriate.

Claims 5 and 6

Claims 5 and 6 each set forth the invention of a product; i.e. a diffractive optical part. However, items that are specified by means of processes such as '...without using fast Fourier transformation,' for example, do not characterize the final form or structure of the invention in question. As a result, the invention that is set forth in claim 1 and the inventions that are set forth in claims 5 and 6 are substantially the same as physical embodiments; therefore, the inventions that are set forth in claims 5 and 6 lack novelty and do not involve an inventive step for the same reasons as are indicated in relation to claim 1, above.

In addition, a person skilled in the art could determine what method of calculation to use in invented processes that include the items that are set forth in claims 5 and 6, as appropriate; therefore, even if claims 5 and 6 were amended so that each claim set forth the invention of a processes, said claims would not involve

an inventive step.

Claim 7

The explanation in relation to the invention that is set forth in claim 1 also pertains to the diffractive optical part that is set forth in claim 7.

In addition, the feature wherein a diffractive optical element for splitting one beam of light into a plurality of beams of light is employed within a laser processing device is disclosed in documents 1 to 3.

Therefore, the invention that is set forth in claim 7 lacks novelty in the light of document 1 and document 3.

In addition, the invention that is set forth in claim 7 does not involve an inventive step in the light of documents 1 to 4.

Claim 8

Document 2 discloses the feature of employing a fsinθ lens as the focusing lens for a laser processing device. Therefore, the invention that is set forth in claim 8 does not involve an inventive step in the light of documents 1 to 4.